WHAT IS CLAIMED IS:

1. A method for manufacturing a GaN based compound semiconductor light-emitting device (LED), comprising the steps of:

(a) forming an n-GaN based layer over a substrate after a buffer layer is formed over said substrate;

(b) forming a multi-quantum well (MQW) active layer over said n-GaN based layer;

(c) forming a p-GaN based layer over said MQW layer and etching away a portion of said n-GaN, said MQW active layer and said p-GaN layers, whereby an exposing region is formed on said n-GaN based layer and an exposing surface is formed on said p-GaN based layer; and

(d) forming a thin Ni/Au layer over said exposing surface of said p-GaN based layer;

(e) forming a thin doped ZnO based layer being transparent and conductive and as a light extraction layer over said Ni/Au layer;

(f) subjecting said doped ZnO based layer other than a region defined for a p-type electrode to a surface treatment whereby a plurality of facets are formed on said doped ZnO based layer; and

(g) forming an n-type electrode over said exposing region of said n-GaN based layer and forming a p-type electrode over said region defined therefor.

2. According to the method in Claim 1, wherein said steps (f) and (g) are interchanged as steps (f') and (g'), wherein:

(f') forming an n-type electrode over said exposing region of said n-GaN based layer and forming a p-type electrode over a pre-defined region of said doped ZnO based layer;

(g') subjecting said doped ZnO based layer not covered by said p-type electrode to a surface treatment by roughening or texturing.

3. According to the method in Claim 1, wherein said Ni/Au layer has a thickness of 0005Å to 0.2 μm.

4. According to the method in Claim 1, wherein said doped ZnO based layer comprises doped ZnO, doped $In_xZn_{1-x}O$, doped $Sn_xZn_{1-x}O$ and doped $In_xSn_yZn_{1-x-y}O$, wherein $0 \leqq X \leqq 1$, $0 \leqq Y \leqq 1$ and $0 \leqq X+Y \leqq 1$.

5. According to the method in Claim 1, 2 and 4, wherein said doped ZnO based layer comprises an Al-doped ZnO based layer.

6. According to the method in Claim 1, wherein said substrate may at least be made of sapphire or SiC.

7. According to the method in Claim 1, wherein said doped ZnO based layer has a thickness of at least 1 μm.

8. A GaN based compound semiconductor light-emitting device (LED), comprising:

a substrate;

a multi-layer epitaxial structure comprising:

a buffer layer being an LT-GaN / HT-GaN layer formed over an upper surface of said substrate, wherein said LT-GaN is a low temperature layer first formed over said substrate, and said HT-GaN

layer is a high temperature layer then formed over said LT-GaN layer;

a first semiconductor layer being an n-GaN based compound semiconductor layer formed over said buffer layer;

a light generating layer being a GaN based compound semiconductor active layer comprising a GaN multiplayer quantum well (MQW) layer; and

a second semiconductor layer being a p-GaN based compound semiconductor formed over said light generating layer;

a Ni/Au layer formed over said second semiconductor layer;

a light extraction layer being a doped metal oxide transmissible to light and formed over said second semiconductor layer and comprising a III-group element doped ZnO based layer and having a thickness of at least 1 μm;

an n-type metal electrode disposed over an exposing region of said first semiconductor layer; and

a p-type metal electrode disposed over said light extraction layer.

9. According to the LED in Claim 8, wherein said substrate is at least made of sapphire or SiC and has a thickness of 300-450 μm, said LT-GaN has a thickness of 30-500 Å, said HT-GaN has a thickness of 0.5-6 μm, said first semiconductor has a thickness of 2-6 μm and said second semiconductor layer has a thickness of 0.2-0.5 μm, said second semiconductor layer is selected from a group consisting of a p-GaN, a p-InGaN and a p-AlInGaN epitaxial layers and said Ni/Au layer has a thickness of 0.005 to 0.2 μm.

10. According to the LED in Claim 8, wherein said light generating layer further comprises an InGaN MQW active layer

11. According to the LED in Claim 8, wherein said light generating layer further comprises an AlGaInN based compound semiconductor epitaxial layer.

12. According to the LED in Claim 8, wherein said doped ZnO based layer comprises a doped ZnO layer, a doped $In_xZn_{1-x}O$ layer, a doped $Sn_xZn_{1-x}O$ layer, wherein $0 \leqq X \leqq 1$, and a doped $In_xSn_yZn_{1-x-y}O$ layer, wherein $0 \leqq X \leqq 1$, $0 \leqq Y \leqq 1$ and $0 \leqq X+Y \leqq 1$.

13. According to the LED in Claim 8, wherein said light extraction layer further comprises a doped metal oxide having an index of refraction of at least 1.5.

14. According to the LED in Claim 8, wherein said light extraction layer is an n-dopant or p-dopant doped metal oxide.

15. According to the LED in Claim 8, wherein said light extraction comprises a rare earth element doped metal oxide.

16. According to the LED in Claim 8, wherein said light extraction layer comprises a doped metal oxide having a transmissible range for a light having a wavelength between 400 and 700 nm.

17. According to the LED in Claim 8, wherein said particularly textured surface comprises a surface having a plurality of cones with circular, triangular and rectangular bottoms or with any other geometrical bottom.

18. According to the LED in Claim 8, wherein said particularly textured surface comprises a plurality of recesses, wherein said recesses are arranged in polygonal or any other geometrical form with a suitable distance from each other as a current path for conduction.

19. According to the LED in Claim 18, wherein each of said plurality of

recesses has a suitable distance with an adjacent recess of said plurality of recesses as a conductive path and arranged in a particular form selected from a group consisting of triangular, rectangular, polygonal, diamond and any other geometrical forms.

20. A method for manufacturing a GaN based compound semiconductor light-emitting device (LED):

forming a multi-layer epitaxial structure over a substrate, wherein said multi-layer epitaxial structure includes a p-type semiconductor layer, an active layer and an n-type semiconductor layer;

forming a doped metal oxide having a suitable thickness and a light transmissibility over said multi-layer epitaxial structure as a light extraction layer; and

disposing an n-type electrode over an exposing region of said n-type semiconductor layer and disposing a p-type electrode over said light extraction layer.

21. According to the method in Claim 20, wherein said doped metal oxide layer is selected from a group consisting of doped ZnO, doped $In_xZn_{1-x}O$, doped $Sn_xZn_{1-x}O$ and doped $In_xSn_yZn_{1-x-y}O$, wherein $0 \leqq X \leqq 1$, $0 \leqq Y \leqq 1$ and $0 \leqq X + Y \leqq 1$.

22. According to the method in Claim 20, wherein said doped metal oxide layer is formed through a technology selected from a group consisting of self-texturing by sputtering, physical vapor deposition, ion plating, pulsed laser evaporation chemical vapor deposition and molecular beam epitaxy technology.

23. According to the method in Claim 20, wherein said doped metal oxide is doped with Al.

24. According to the method in Claim 20, wherein said doped metal oxide is doped with any of III-group elements.